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Methodical Framework for Evaluating the Level of the Carrying Capacity of Transport Systems in View of the Irregularity of Cargo Flows

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Abstract

© 2018 The Author(s). The directions of transit freight flows are characterised by a high level of unevenness in the directions and regions of destination. This leads to an objective decrease in the level of use of the transport system's traffic capacities, to an increase in unproductive transit transport runs and negatively affects the efficiency of transport. However, modern research does not pay enough attention to improving the efficiency of transit traffic, taking into account the unevenness of freight flows. Insufficient scientific study of these issues determines the relevance of the study. Methodical bases of integration of transit traffic by creation of the transit terminals providing reduction of unproductive runs of transit transport are developed. Analytical expressions are obtained for estimating the excessive transit traffic capacities of transport systems and for estimating the effect as a result of the integration of freight flows in terminal complexes. Based on the analysis of the load of transit vehicles, it is established that, as a part of the inbound flow, the share of empty cars for all the regions of dispatch of goods exceeds 80 %, in the composition of the exit flow - on average 15 %. The bulk of empty transport goes to the border regions - over 30 %, and in the international transit flow - about 5 %. Analytic expressions are obtained for calculating the utilization coefficient of transit transport routes in interterminal traffic which characterise its dependence on the unevenness of transit freight traffic on adjacent routes. As a result of analyzing the volumes of cargo transshipments in Chelyabinsk region within the entry and exit flow, the share of empty cars for all the regions is about 85% and 15%, respectively. The indicator of multidirectionality in terms of the maximum capacity of freight flows with a multitude of mutual freight traffic terminals connected with it has been developed. Its average value for all terminal complexes was 0.83. Integration of multidirectional interterminal freight flows at the transit terminal located in Chelyabinsk region, which is multidirectional in terms of maximum capacity, ensures a reduction of the excessive capacity by 565.1 tons/year and the total cost of transit transport operations by more than 420 million rubles a year. The developed methodological bases of integration of interterminal transit traffic are oriented at practical application. The results of the research can be used in the activities of freight forwarding organisations to improve the efficiency of transit transport, to optimise the operation of transport and warehouse complexes.

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Keywords

terminal complexes, traffic capacities, transit traffic, transport systems, unevenness of freight

flows

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